

M E M O R A N D U M

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DATE: October 28, 1999

**SUBJECT: SENSORY EVALUATION REPORT FOR SENSORY STUDY #3354(01)(02) -
NEOTAME PEPPERMINT CHEWING GUM FLAVOR SPARING STUDY -
DESCRIPTIVE PROFILE PANEL RESULTS**

STUDY DATES: 8/24/99 - 8/26/99

Study protocol-

Protocol for Sensory Evaluation with Ingestion of NC-00723 (Neotame) in Food and Beverages,
IRB #2624 amended 1/21/99

Protocol Managers-

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Sensory Study #: 3354(01)(02)
Study Title: Neotame Peppermint Chewing Gum Flavor Sparing Study - Descriptive Profile Panel Results

Product Tested: Peppermint Chewing Gum
Test Dates: August 24, 25, 26, 1999
Panelists: Trained (n=8)
Location: Mt. Prospect

Objective: To determine the sensory effects of reducing the flavor level in peppermint chewing gum sweetened with 100 ppm neotame as compared to a control sample of 3000 ppm aspartame (APM) with the full amount of flavor. The neotame and APM samples have been formulated to have similar sweetness levels.

Samples:

- 1) 3000 ppm Aspartame with 1.5% Flavor - NB#1537-279
- 2) 100 ppm Neotame with 1.5% Flavor (0% reduction) - NB#1537-273
- 3) 100 ppm Neotame with 1.25% Flavor (16.6% reduction) - NB#1537-270
- 4) 100 ppm Neotame with 1.0% Flavor (33% reduction) - NB#1537-267
- 5) 100 ppm Neotame with 0.75% Flavor (50% reduction) - NB#1537-264

Samples tested were prepared at Mt. Prospect on August 17 and 18, 1999. Samples were held frozen until evaluated. The neotame used was Lot# 96NK008-8. Refer to Notebook #1537 for formulation and preparation details.

Test Methods: Flavor Profile and Sweetness Temporal Profile
The sensory profiling of the sweetened water solutions was carried out using the Spectrum Method of Descriptive Analysis.

Attributes were scored using the universal 15-point scale as follows:

<u>Scale</u>	<u>Intensity</u>
0	None of the attribute present
2	Approximate threshold intensity - trace
5	Slight or low level
7.5	Moderate
10	Strong

Panelists evaluated the sweetness, minty flavor, cooling mouthfeel and bitterness of the chewing gum over twenty minutes at timed intervals. To minimize fatigue, the five test samples with two replications were evaluated over three sessions; three or four samples were presented during each session. Over the three sessions, the samples were presented to the panelists in a balanced order, unwrapped, in two ounce plastic cups,

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randomly coded with three-digit numbers. Samples were assessed in duplicate. The panelists were given a ten minute break between samples to minimize carry-over effects. Still water, natural applesauce and crackers were available as palate cleansers between samples.

Key Findings:

The sweetness of all samples of chewing gum with neotame was prolonged as compared to the APM control.

In general, a neotame sweetened peppermint chewing gum with 16.6% reduction in flavor achieved similar mint flavor intensity as the APM control.

Sweetness

- Comparing the panelists' sweetness ratings across samples at each evaluation time point (ie. 30 sec, 1 min, 2 min, etc.), the sweetness intensities were generally similar through eight minutes of chewing.
- Sweetness differences occurred at the ten minute evaluation with three of the neotame samples (1.5%, 1.25% and 1.0% flavor) rated as sweeter than the APM control.
- All neotame sweetened samples were significantly sweeter than the control at twelve minutes and through twenty minutes of chewing.
- The sweetness half-lives for the neotame samples, were on average, approximately ten minutes longer than the APM sample.

Mint Flavor

- The neotame sweetened chewing gum with an equal amount of flavor added as the APM control (1.5%) was similar in mint flavor from the initial rating at fifteen seconds through eight minutes of chewing. From ten minutes until the end of chewing at twenty minutes, the neotame sample had a significantly higher mint flavor intensity than the APM control.
- The neotame sweetened chewing gum with 1.25% flavor added (16.6% reduction in flavor) provided similar mint flavor intensity as the APM control from two through sixteen minutes of chewing. By twenty minutes, this neotame sample with 16.6% reduction in peppermint flavor was stronger in mint flavor than the APM control.
- The APM control was higher in mint flavor intensity from the initial rating through twelve minutes of chewing than the samples with neotame and 1.0% and 0.75% flavor added; 33% and 50% reductions, respectively. At the sixteen and twenty minute evaluations, these reduced

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flavor neotame samples were similar in mint flavor intensity as the APM control.

- At a lower statistical confidence (90%), the mint flavor half-lives of the neotame samples were extended by 59 - 125% over the APM control.

ATTACHMENTS:

- Attachment 1: Summary of Attribute Means for SWEETNESS
- Attachment 2: Summary of Attribute Means for MINTY FLAVOR
- Attachment 3: Summary of Attribute Means for COOLING
- Attachment 4: Summary of Attribute Means for BITTERNESS
- Attachment 5: Estimated Half-lives of SWEETNESS and MINTY FLAVOR

ATTACHMENT 1
PEPPERMINT CHEWING GUM - FLAVOR SPARING WITH NEOTAME
SUMMARY OF SWEETNESS ATTRIBUTE MEANS
SS#3354(01)(02) **Test Date:8/24 -26/99**

Samples Attribute @ time rated (min:sec)	3000 ppm APM 1.5% flavor	100 ppm NTM 1.5% flavor	100 ppm NTM 1.25% flavor	100 ppm NTM 1.0% flavor	100 ppm NTM 0.75% flavor
Sweet 0:15	4.2	4.5	4.1	4.2	3.8
Sweet 0:30	5.3	5.4	5.4	5.3	4.9
Sweet 1:00	6.4	6.3	6.7	6.3	6.1
Sweet 1:30	7.1	6.8	7.1	6.9	6.8
Sweet 2:00	7.0	7.2	7.0	6.9	6.9
Sweet 3:00	6.5	6.8	6.6	6.6	6.7
Sweet 4:00	5.8	6.2	6.1	5.9	5.8
Sweet 6:00	a 4.9	b 5.4	b 5.4	ab 5.2	a 5.0
Sweet 8:00	4.3	4.9	5.1	5.1	4.5
Sweet 10:00	A 3.8	C 4.8	BC 4.5	BC 4.6	AB 4.1
Sweet 12:00	A 3.0	BC 4.3	C 4.5	B 3.9	B 3.9
Sweet 16:00	A 2.0	B 3.9	B 3.9	B 3.6	B 3.7
Sweet 20:00	A 1.3	B 3.3	B 3.9	B 3.4	B 3.3

Attributes mean scores sharing a common **UPPPER CASE** letter do not differ at 95% confidence level.

Attributes mean scores sharing a common **lower case** letter do not differ at 90% confidence level.

ATTACHMENT 2
PEPPERMINT CHEWING GUM - FLAVOR SPARING WITH NEOTAME
SUMMARY OF MINTY FLAVOR ATTRIBUTE MEANS
SS#3354(01)(02) **Test Date:8/24 -26/99**

Samples Attribute @ time rated (min:sec)	3000 ppm APM 1.5% flavor	100 ppm NTM 1.5% flavor	100 ppm NTM 1.25% flavor	100 ppm NTM 1.0% flavor	100 ppm NTM 0.75% flavor
Minty 0:15	b 4.5	b 4.5	ab 4.1	a 3.9	a 3.7
Minty 0:30	c 5.5	bc 5.3	ab 4.7	ab 4.7	a 4.4
Minty 1:00	c 6.6	bc 6.1	ab 5.7	ab 5.6	a 5.0
Minty 1:30	6.9	6.5	6.1	6.0	5.5
Minty 2:00	C 7.0	BC 6.8	ABC 6.3	AB 6.1	A 5.8
Minty 3:00	C 7.0	C 6.9	BC 6.4	AB 6.0	A 5.7
Minty 4:00	C 5.3	BC 5.2	ABC 4.8	AB 4.6	A 4.4
Minty 6:00	bc 4.8	c 5.1	bc 4.7	ab 4.4	a 4.1
Minty 8:00	BC 4.5	C 5.0	BC 4.5	AB 4.3	A 4.0
Minty 10:00	C 4.3	D 4.7	C 4.3	B 4.1	A 3.8
Minty 12:00	4.0	4.4	4.1	3.9	3.8
Minty 16:00	A 3.5	B 4.2	A 3.8	A 3.5	A 3.7
Minty 20:00	A 2.9	C 3.8	B 3.4	AB 3.2	AB 3.3

Attributes mean scores sharing a common **UPPPER CASE** letter do not differ at 95% confidence level.
Attributes mean scores sharing a common **lower case** letter do not differ at 90% confidence level.

ATTACHMENT 3
PEPPERMINT CHEWING GUM - FLAVOR SPARING WITH NEOTAME
SUMMARY OF COOLING ATTRIBUTE MEANS
SS#3354(01)(02) **Test Date:8/24 -26/99**

Samples Attribute @ time rated (min:sec)	3000 ppm APM 1.5% flavor	100 ppm NTM 1.5% flavor	100 ppm NTM 1.25% flavor	100 ppm NTM 1.0% flavor	100 ppm NTM 0.75% flavor
Cooling 0:15	b 4.5	b 4.5	ab 4.1	a 3.9	a 3.7
Cooling 0:30	c 5.5	bc 5.3	ab 4.7	ab 4.7	a 4.4
Cooling 1:00	c 6.6	bc 6.1	ab 5.7	ab 5.6	a 5.0
Cooling 1:30	6.9	6.5	6.1	6.0	5.5
Cooling 2:00	C 7.0	BC 6.8	ABC 6.3	AB 6.1	A 5.8
Cooling 3:00	C 7.0	C 6.9	BC 6.4	AB 6.0	A 5.7
Cooling 4:00	b 6.6	b 6.5	ab 5.9	a 5.6	a 5.2
Cooling 6:00	C 6.4	C 6.4	BC 5.8	AB 5.7	A 5.2
Cooling 8:00	C 6.4	C 6.5	B 5.8	B 5.7	A 5.1
Cooling 10:00	bc 6.1	c 6.3	abc 5.6	ab 5.3	a 4.9
Cooling 12:00	B 5.9	B 5.9	AB 5.4	A 5.1	A 4.8
Cooling 16:00	B 5.7	B 5.8	AB 5.3	A 4.7	A 4.6
Cooling 20:00	CD 5.3	D 5.7	BC 4.9	AB 4.6	A 4.4

Attributes mean scores sharing a common **UPPPER CASE** letter do not differ at 95% confidence level.

Attributes mean scores sharing a common **lower case** letter do not differ at 90% confidence level.

ATTACHMENT 4
PEPPERMINT CHEWING GUM - FLAVOR SPARING WITH NEOTAME
SUMMARY OF BITTERNESS ATTRIBUTE MEANS
SS#3354(01)(02) Test Date:8/24 -26/99

Samples Attribute @ time rated (min:sec)	3000 ppm APM 1.5% flavor	100 ppm NTM 1.5% flavor	100 ppm NTM 1.25% flavor	100 ppm NTM 1.0% flavor	100 ppm NTM 0.75% flavor
Bitter 0:15	0.4	0.3	0.1	0.3	0.1
Bitter 0:30	B 0.5	A 0.3	A 0.2	A 0.3	A 0.2
Bitter 1:00	c 0.4	bc 0.3	a 0.2	ab 0.2	abc 0.3
Bitter 1:30	0.4	0.4	0.3	0.2	0.3
Bitter 2:00	0.4	0.4	0.4	0.2	0.3
Bitter 3:00	0.6	0.5	0.4	0.3	0.3
Bitter 4:00	0.7	0.5	0.5	0.4	0.4
Bitter 6:00	0.9	0.7	0.5	0.5	0.5
Bitter 8:00	0.8	0.8	0.5	0.6	0.5
Bitter 10:00	0.8	0.6	0.5	0.5	0.5
Bitter 12:00	0.7	0.6	0.5	0.6	0.5
Bitter 16:00	0.6	0.5	0.4	0.4	0.4
Bitter 20:00	0.6	0.5	0.3	0.4	0.4

Attributes mean scores sharing a common **UPPPER CASE** letter do not differ at 95% confidence level.
Attributes mean scores sharing a common **lower case** letter do not differ at 90% confidence level.

ATTACHMENT 5
ESTIMATED HALF LIVES^{a,b} AND STATISTICAL ANNOTATIONS
SS#3354(01)(02) **Test Date:8/24 -26/99**

Attribute	APM @1.5% Flavor	NTM @0.75% Flavor	NTM @1.0% Flavor	NTM @1.25% Flavor	NTM @1.5% Flavor
Sweet ^a	7.6 A	17.0 B	17.2 B	20.7 B	16.9 B
Minty ^b	19.7 a	44.3 c	31.3 b	31.7 b	33.1 b

^a half life is the time in minutes for the sweet intensity to fall to half of its 2 minute (maximal) level;

^b half life is the time in minutes for the minty intensity to fall to half of its 4 minute level (at 4 minutes, minty is separately rated from cooling, and is past its maximum level);

* half lives sharing a common letter are not statistically significantly different at the 5% (uppercase letters) or 10% level (lowercase letters) of significance.